Penyelesaian Lengkap

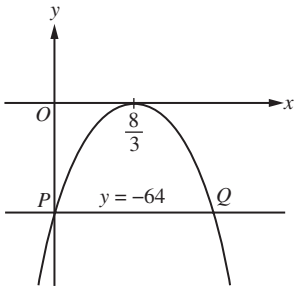
SET 2

KERTAS 1

1 (a) (i) $f(x) = -(3x-8)^2 + k$

Titik maksimum bagi lengkung itu menyentuh paksi-x.
The maximum point of the curve touches the x-axis.
$\therefore k = 0$

(ii)



Apabila $x = 0$,
When $x = 0$,
$y = -(-8)^2 + 0$
$= -64$

Koordinat bagi titik P ialah $(0, -64)$.
The coordinates of point P are $(0, -64)$.

$PQ = 2\left(\frac{8}{3}\right)$
$= \frac{16}{3}$

$\therefore$ Koordinat bagi titik Q ialah $\left(\frac{16}{3}, -64\right)$.

$\therefore$ *The coordinates of point Q are* $\left(\frac{16}{3}, -64\right)$.

Kaedah alternatif
Alternative method

Apabila $f(x) = -64$, $-(3x-8)^2 = -64$,
When $f(x) = -64$, $-(3x-8)^2 = -64$,
$(3x-8)^2 = -64$
$3x - 8 = 8$ atau/*or* $3x - 8 = -8$
$3x = 16$ atau/*or* $3x = 0$
$x = \frac{16}{3}$ atau/*or* $x = 0$
$x = 0$ adalah sepadan dengan titik P.
$x = 0$ *is corresponding to point P.*
$\therefore$ Koordinat bagi titik Q ialah $\left(\frac{16}{3}, -64\right)$.
$\therefore$ *The coordinates of point Q are* $\left(\frac{16}{3}, -64\right)$.

(b) $x^2 - 2x - 5 + 4\sqrt{2} = 0$
$x^2 - 2x - 5 + 4\sqrt{2}$
$= (3 - \sqrt{2})^2 - 2(3 - \sqrt{2}) - 5 + 4\sqrt{2}$
$= 9 - 6\sqrt{2} + 2 - 6 + 2\sqrt{2} - 5 + 4\sqrt{2}$
$= 0$

$\therefore 3 - \sqrt{2}$ ialah satu punca bagi persamaan kuadratik $x^2 - 2x - 5 + 4\sqrt{2} = 0$.
$\therefore 3 - \sqrt{2}$ *is a root of the quadratic equation* $x^2 - 2x - 5 + 4\sqrt{2} = 0$.

$x_1 = 3 - \sqrt{2}$
$x_1 + x_2 = 2$
$3 - \sqrt{2} + x_2 = 2$
$x_2 = -1 + \sqrt{2}$

$\therefore$ Punca yang satu lagi bagi persamaan kuadratik itu ialah $-1 + \sqrt{2}$.
$\therefore$ *The other root of the quadratic equation is* $-1 + \sqrt{2}$.

Kaedah alternatif
Alternative method

$x_1 x_2 = -5 + 4\sqrt{2}$
$(3 - \sqrt{2})x_2 = -5 + 4\sqrt{2}$
$x_2 = \frac{-5 + 4\sqrt{2}}{3 - \sqrt{2}}$
$= \frac{(-5 + 4\sqrt{2})(3 + \sqrt{2})}{(3 - \sqrt{2})(3 + \sqrt{2})}$
$= \frac{-15 - 5\sqrt{2} + 12\sqrt{2} + 8}{9 - 2}$
$= \frac{-7 + 7\sqrt{2}}{7}$
$= \frac{7(-1 + \sqrt{2})}{7}$
$= -1 + \sqrt{2}$

$\therefore$ Punca yang satu lagi bagi persamaan kuadratik itu ialah $-1 + \sqrt{2}$.
$\therefore$ *The other root of the quadratic equation is* $-1 + \sqrt{2}$.

2 $x + 2y = 1$ … ①
$x^2 + 2y^2 - xy = 3$ … ②
Daripada ①, $x = 1 - 2y$
From ①, $x = 1 - 2y$
Gantikan $x = 1 - 2y$ ke dalam ②,
Substitute $x = 1 - 2y$ *into* ②,
$(1 - 2y)^2 + 2y^2 - (1 - 2y)y = 3$
$1 - 4y + 4y^2 + 2y^2 - y + 2y^2 = 3$
$8y^2 - 5y - 2 = 0$

$y = \frac{-(-5) \pm \sqrt{(-5)^2 - 4(8)(-2)}}{2(8)}$
$= \frac{5 \pm \sqrt{25 + 64}}{16}$
$= \frac{5 \pm \sqrt{89}}{16}$
$y = 0.9021$ atau/*or* $y = -0.2771$

Apabila $y = 0.9021$,
When $y = 0.9021$,
$x = 1 - 2(0.9021)$
$= -0.8042$

Apabila $y = -0.2771$,
When $y = -0.2771$,

$x = 1 - 2(-0.2771)$
$= 1.554$
$x = -0.804, y = 0.902$ atau/*or* $x = 1.554, y = -0.277$

3 $\dfrac{32^x}{2^x \times 4^x}$
$= \dfrac{(2^5)^x}{2^x \times (2^2)^x}$
$= \dfrac{2^{5x}}{2^x \times 2^{2x}}$
$= 2^{5x-x-2x}$
$= 2^{2x}$

$\dfrac{32^x}{2^x \times 4^x} - 12(2^x) + 32 = 0$
$2^{2x} - 12(2^x) + 32 = 0$

Katakan $y = 2^x$,
Let $y = 2^x$,
$y^2 - 12y + 32 = 0$
$(y-4)(y-8) = 0$
$y = 4$ atau/*or* $y = 8$

Apabila $y = 4$,
When $y = 4$,
$2^x = 4$
$2^x = 2^2$
$x = 2$

Apabila $y = 8$,
When $y = 8$,
$2^x = 8$
$2^x = 2^3$
$x = 3$
$\therefore x = 2$ atau/*or* $x = 3$

4 $\log_2 (x^{\log_2 x}) = 4$

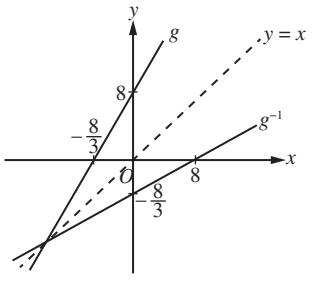
Katakan $\log_2 x = y$
Let $\log_2 x = y$
$\log_2 x^y = 4$
$y \log_2 x = 4$
$y^2 = 4$
$y = \pm 2$

Apabila $y = 2$,
When $y = 2$,
$\log_2 x = 2$
$x = 2^2$
$= 4$

Apabila $y = -2$,
When $y = -2$,
$\log_2 x = -2$
$x = 2^{-2}$
$= \dfrac{1}{4}$

$x = \dfrac{1}{4}$ atau/*or* $x = 4$

5 (a) $g : x \to 3x + 8$



(b) $g(x) = 3x + 8$
$f^{-1}[g(x)] = \dfrac{5 - 4x}{x}$
$f^{-1}(3x + 8) = \dfrac{5 - 4x}{x}$

Katakan $3x + 8 = u$
Let $3x + 8 = u$
$3x = u - 8$
$x = \dfrac{u - 8}{3}$

$f^{-1}(u) = \dfrac{5 - 4\left(\dfrac{u-8}{3}\right)}{\dfrac{u-8}{3}}$
$= \dfrac{15 - 4(u-8)}{u-8}$
$= \dfrac{15 - 4u + 32}{u-8}$
$= \dfrac{47 - 4u}{u-8}$
$f^{-1}(x) = \dfrac{47 - 4x}{x-8}$

$\therefore$ Fungsi yang memetakan set Q kepada set R ialah
$f^{-1} : x \to \dfrac{47 - 4x}{x-8}, x \neq 8$
$\therefore$ *The function that maps set Q to set R is*
$f^{-1} : x \to \dfrac{47 - 4x}{x-8}, x \neq 8$

6 (a) $w = 3t - 2t^3$
$\dfrac{dw}{dt} = 3 - 6t^2$
$= 3(1 - 2t^2)$
$x = 4t^2 + 9$
$\dfrac{dx}{dt} = 8t$
$\dfrac{dw}{dx} = \dfrac{dw}{dt} \times \dfrac{dt}{dx}$
$= \dfrac{dw}{dt} \times \dfrac{1}{\dfrac{dx}{dt}}$
$= 3(1 - 2t^2) \times \dfrac{1}{8t}$
$= \dfrac{3(1 - 2t^2)}{8t}$

(b) $\delta w = 5.3 - 5$
$= 0.3$
$\delta w \approx \dfrac{dw}{dx} \times \delta x$
$\delta w \approx \dfrac{3(1 - 2t^2)}{8t} \times \delta x$
Apabila $\delta w = 0.3, t = 1$,
When $\delta w = 0.3, t = 1$,
$0.3 \approx \dfrac{3(1-2)}{8} \times 8$
$0.3 \approx -\dfrac{3}{8} \times \delta x$
$\delta x \approx -0.8$
$\therefore$ Perubahan kecil dalam x ialah -0.8.
$\therefore$ *The small change in x is* -0.8.

(c) $x = 4t^2 + 9$
$4t^2 = x - 9$
$2t^2 = \dfrac{x-9}{2}$
$\dfrac{dw}{dx} = \dfrac{3(1 - 2t^2)}{8t}$
$= \dfrac{3\left(1 - \dfrac{x-9}{2}\right)}{8\left(\dfrac{\sqrt{x-9}}{2}\right)}$

$$= \frac{3(2-x+9)}{8\sqrt{x-9}}$$
$$= \frac{3}{8}\left(\frac{11-x}{\sqrt{x-9}}\right)$$
$$\frac{d^2w}{dx^2} = \frac{3}{8}\left[\frac{\sqrt{x-9}(-1)-(11-x)\left[\frac{1}{2}(x-9)^{-\frac{1}{2}}\right]}{x-9}\right]$$
$$= \frac{3}{8}\left[\frac{-2\sqrt{x-9}-\frac{11-x}{\sqrt{x-9}}}{2(x-9)}\right]$$
$$= \frac{3}{16}\left[\frac{-2(x-9)-(11-x)}{(x-9)\sqrt{x-9}}\right]$$
$$= \frac{3}{16}\left[\frac{-2x+18-11+x}{(x-9)^{\frac{3}{2}}}\right]$$
$$= \frac{3(7-x)}{16(x-9)^{\frac{3}{2}}}$$

7 (a) Bilangan cara untuk memilih 4 orang lelaki daripada 7 orang lelaki
Number of ways to select 4 *boys from* 7 *boys*
$= {}^7C_4$
$= 35$

Bilangan cara untuk memilih 2 orang perempuan daripada 4 orang perempuan
Number of ways to select 2 *girls from* 4 *girls*
$= {}^4C_2$
$= 6$

Bilangan pemilihan yang boleh dilakukan
Number of selections that can be done
$= 35 \times 6$
$= 210$

(b) (i) Bilangan cara untuk menyusun 4 orang lelaki itu bersebelahan dan 2 orang perempuan
Number of ways to arrange the 4 *boys side by side and* 2 *girls*
$= 3!$
$= 6$

Bilangan cara untuk menyusun 4 orang lelaki itu
Number of ways to arrange the 4 *boys*
$= 4!$
$= 24$

Bilangan cara kesemua pengawas boleh disusun dengan keempat-empat lelaki itu bersebelahan
Number of ways to arrange all the prefects who are selected in a row such that all the four boys are side by side
$= 6 \times 24$
$= 144$

(ii)

4	3	4	2	2	1

Lelaki *Boy* Perempuan *Girl*

4	3	2	4	2	1

Perempuan *Girl* Lelaki *Boy*

Bilangan cara untuk menyusun kesemua pengawas yang dipilih itu dalam satu baris dengan keadaan seorang lelaki dan seorang perempuan berada di pertengahan baris
Number of ways to arrange all the selected prefects in a row such that a boy and a girl are at the middle of the row
$= 4 \times 3 \times 4 \times 2 \times 2 \times 1 + 4 \times 3 \times 2 \times 4 \times 2 \times 1$
$= 192 + 192$
$= 384$

8 (a) (i) Koordinat bagi M
Coordinates of M
$= \left(\frac{-5+1}{2}, -4\right)$
$= (-2, -4)$

(ii) $f(x) = p(x+2)^2 - 4$

Kaedah 1/*Method* 1

Gantikan $x = -5, f(x) = 3$ ke dalam $f(x) = p(x+2)^2 - 4$,
Substitute $x = -5, f(x) = 3$ *into* $f(x) = p(x+2)^2 - 4$,
$3 = p(-5+2)^2 - 4$
$3 = 9p - 4$
$9p = 7$
$p = \frac{7}{9}$

Kaedah 2/*Method* 2

Gantikan $x = 1, f(x) = 3$ ke dalam $f(x) = p(x+2)^2 - 4$,
Substitute $x = 1, f(x) = 3$ *into* $f(x) = p(x+2)^2 - 4$,
$3 = p(1+2)^2 - 4$
$3 = 9p - 4$
$9p = 7$
$p = \frac{7}{9}$

(b) $y = \frac{a}{x} - bx^2$
$xy = a - bx^3$
$Y = xy, X = x^3$
$Y = a - bX$

Pintasan-Y bagi garis lurus itu ialah k.
The Y-intercept of the straight line is k.
$a = k \ldots ①$

Kecerunan bagi garis lurus itu ialah $-\frac{k}{2k+3}$.
The gradient of the straight line is $-\frac{k}{2k+3}$.

$-b = \frac{k}{2k+3}$
$b = \frac{k}{2k+3} \ldots ②$

Gantikan $a = k$ ke dalam ②,
Substitute $a = k$ *into* ②,
$b = \frac{a}{2a+3}$
$2ab + 3b = a$
$a(1-2b) = 3b$
$a = \frac{3b}{1-2b}$

9 (a) $\sqrt{3} + 4 - \frac{(3-\sqrt{3})^2}{2\sqrt{3}}$
$= \sqrt{3} + 4 - \frac{9 - 6\sqrt{3} + 3}{2\sqrt{3}}$
$= \sqrt{3} + 4 - \frac{12 - 6\sqrt{3}}{2\sqrt{3}}$
$= \sqrt{3} + 4 - \frac{6}{\sqrt{3}} + 3$
$= \sqrt{3} + 7 - \frac{6\sqrt{3}}{3}$
$= \sqrt{3} + 7 - 2\sqrt{3}$
$= 7 - \sqrt{3}$

(b) (i) Luas sektor $PQR = \frac{9\pi}{5} r^2 \text{ cm}^2$

Area of sector $PQR = \frac{9\pi}{5} r^2 \text{ cm}^2$

$$\frac{1}{2}(3r)^2\theta = \frac{9\pi}{5} r^2$$
$$\frac{9}{2} r^2\theta = \frac{9\pi}{5} r^2$$
$$\theta = \frac{2\pi}{5} \text{ rad}$$

(ii) Perimeter bagi seluruh rajah

Perimeter of the whole diagram

$$= (3r)\left(\frac{2\pi}{5}\right) + (2r)\left(\frac{4\pi}{5}\right) + 3r + 2r + r$$
$$= \frac{6\pi}{5} r + \frac{8\pi}{5} r + 6r$$
$$= \left(\frac{14\pi}{5} + 6\right) r \text{ cm}$$

10 $a + ar + ar^2 + ar^3 + \ldots = 28$

$$\frac{a}{1-r} = 28$$
$$a = 28(1-r) \ldots ①$$

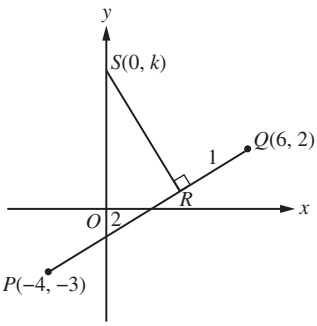
$a^2 + a^2r^2 + a^2r^4 + a^2r^6 + \ldots = 112$

$$\frac{a^2}{1-r^2} = 112$$
$$a^2 = 112(1-r^2) \ldots ②$$

$$[28(1-r)]^2 = 112(1-r^2)$$
$$784(1-r)^2 = 112(1-r^2)$$
$$7(1-r)^2 = (1+r)(1-r)$$
$$r \neq 1, 7(1-r) = (1+r)$$
$$7 - 7r = 1 + r$$
$$8r = 6$$
$$r = \frac{3}{4}$$

Daripada/*From* ①, $a = 28\left(1 - \frac{3}{4}\right) = 7$

11 (a)



$$\left(\frac{2(6)+1(-4)}{3}, \frac{2(2)+1(-3)}{3}\right) = \left(\frac{8}{3}, \frac{1}{3}\right)$$

∴ Koordinat bagi R ialah $\left(\frac{8}{3}, \frac{1}{3}\right)$.

∴ *The coordiantes of R are* $\left(\frac{8}{3}, \frac{1}{3}\right)$.

$$m_{PQ} = \frac{2-(-3)}{6-(-4)}$$
$$= \frac{2+3}{6+4}$$
$$= \frac{5}{10}$$
$$= \frac{1}{2}$$
$$m_{RS} = -2$$
$$\frac{k - \frac{1}{3}}{0 - \frac{8}{3}} = -2$$
$$k - \frac{1}{3} = \frac{16}{3}$$
$$k = \frac{17}{3}$$

∴ Koordinat bagi S ialah $\left(0, \frac{17}{3}\right)$.

∴ *The coordinates of S are* $\left(0, \frac{17}{3}\right)$.

(b) Luas bagi ΔPQS

Area of ΔPQS

$$= \frac{1}{2}\left|\begin{matrix} -4 & 6 & 0 & -4 \\ -3 & 2 & \frac{17}{3} & -3 \end{matrix}\right|$$
$$= \frac{1}{2}\left|\left[(-4)(2) + 6\left(\frac{17}{3}\right) + 0(-3)\right] - \left[(-3)(6) + 2(0) + \frac{17}{3}(-4)\right]\right|$$
$$= \frac{1}{2}\left|[-8 + 34 + 0] - \left[-18 + 0 - \frac{68}{3}\right]\right|$$
$$= \frac{1}{2}\left|26 + 18 + \frac{68}{3}\right|$$
$$= \frac{100}{3}$$
$$= 33\frac{1}{3} \text{ unit}^2/\textit{units}^2$$

Kaedah alternatif

Alternative method

$$PQ = \sqrt{(6+4)^2 + (2+3)^2}$$
$$= \sqrt{100 + 25}$$
$$= \sqrt{125}$$
$$= 5\sqrt{5} \text{ unit}/\textit{units}$$
$$RS = \sqrt{\left(\frac{8}{3} - 0\right) + \left(\frac{1}{3} - \frac{17}{3}\right)^2}$$
$$= \sqrt{\frac{64}{9} + \frac{256}{9}}$$
$$= \sqrt{\frac{320}{9}}$$
$$= \frac{8\sqrt{5}}{3} \text{ unit}/\textit{units}$$

Luas bagi ΔPQS

Area of ΔPQS

$$= \frac{1}{2} \times 5\sqrt{5} \times \frac{8\sqrt{5}}{3}$$
$$= \frac{100}{3}$$
$$= 33\frac{1}{3} \text{ unit}^2/\textit{units}^2$$

12 (a) $(m-4)\underset{\sim}{a} = (3n+2)\underset{\sim}{b}$

$\underset{\sim}{a}$ dan $\underset{\sim}{b}$ adalah tidak selari.

$\underset{\sim}{a}$ *and* $\underset{\sim}{b}$ *are not parallel.*

$$m - 4 = 0$$
$$m = 4$$
$$3n + 2 = 0$$
$$3n = -2$$
$$n = -\frac{2}{3}$$

(b) (i) $\overrightarrow{AD} + \overrightarrow{DB} = \overrightarrow{AB}$

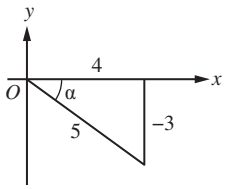
$$\overrightarrow{DB} = \overrightarrow{AB} - \overrightarrow{AD}$$
$$= 8\underset{\sim}{p} - 12\underset{\sim}{q}$$

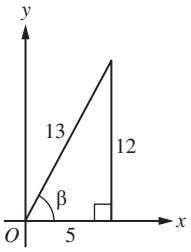
(ii) $\overrightarrow{DC} + \overrightarrow{CE} = \overrightarrow{DE}$

$$\overrightarrow{CE} = \overrightarrow{DE} - \overrightarrow{DC}$$

$$= \frac{3}{4}\overrightarrow{DB} - \overrightarrow{AB}$$
$$= \frac{3}{4}(8\underset{\sim}{p} - 12\underset{\sim}{q}) - 8\underset{\sim}{p}$$
$$= 6\underset{\sim}{p} - 9\underset{\sim}{q} - 8\underset{\sim}{p}$$
$$= -2\underset{\sim}{p} - 9\underset{\sim}{q}$$

13 (a) $\tan\alpha = -\frac{3}{4}$ $\quad\quad$ $\cos\beta = \frac{5}{13}$



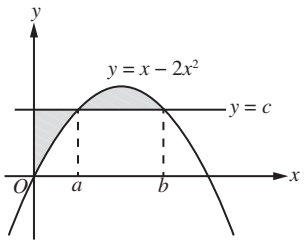


$$\sin(2\alpha - \beta) = \sin 2\alpha\cos\beta - \cos 2\alpha\sin\beta$$
$$= 2\sin\alpha\cos\alpha\cos\beta - (2\cos^2\alpha - 1)\sin\beta$$
$$= 2\left(-\frac{3}{5}\right)\left(\frac{4}{5}\right)\left(\frac{5}{13}\right) - \left[2\left(\frac{4}{5}\right)^2 - 1\right]\left(\frac{12}{13}\right)$$
$$= -\frac{24}{65} - \frac{84}{325}$$
$$= -\frac{204}{325}$$

(b) $\cos 2x = \sin 2x,\ 0 < x < 2\pi$

$$\frac{\sin 2x}{\cos 2x} = 1$$
$$\tan 2x = 1$$
$$2x = \frac{\pi}{4}, \frac{5\pi}{4}, 2\pi + \frac{\pi}{4}, 2\pi + \frac{5\pi}{4}$$
$$2x = \frac{\pi}{4}, \frac{5\pi}{4}, \frac{9\pi}{4}, \frac{13\pi}{4}$$
$$x = \frac{\pi}{8}, \frac{5\pi}{8}, \frac{9\pi}{8}, \frac{13\pi}{8}$$

14 (a)



$$ac - \int_0^a (x - 2x^2)\,dx = \int_a^b (x - 2x^2)\,dx - (b - a)c$$
$$ac + (b - a)c = \int_0^a (x - 2x^2)\,dx + \int_a^b (x - 2x^2)\,dx$$
$$ac + bc - ac = \int_0^b (x - 2x^2)\,dx$$
$$bc = \left[\frac{x^2}{2} - \frac{2x^3}{3}\right]_0^b$$
$$bc = \frac{b^2}{2} - \frac{2b^3}{3}$$

$b \neq 0,\ \therefore c = \frac{b}{2} - \frac{2b^2}{3} \ldots ①$

$y = x - 2x^2$

Gantikan $x = b$, $y = c$ ke dalam $y = x - 2x^2$,
Substitute $x = b$, $y = c$ *into* $y = x - 2x^2$,

$c = b - 2b^2 \ldots ②$

$$b - 2b^2 = \frac{b}{2} - \frac{2b^2}{3}$$
$$b - \frac{b}{2} = 2b^2 - \frac{2b^2}{3}$$
$$\frac{b}{2} = \frac{4b^2}{3}$$
$$\frac{1}{2} = \frac{4b}{3}$$
$$b = \frac{3}{8}$$

Daripada ②,
From ②,

$$c = \frac{3}{8} - 2\left(\frac{3}{8}\right)^2$$
$$= \frac{3}{8} - \frac{9}{32}$$
$$= \frac{3}{32}$$

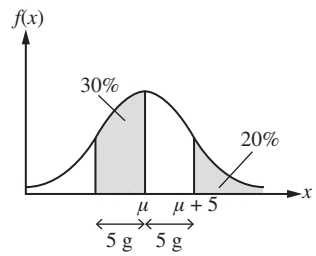
15 (a)

x	0	2	4	6
$P(X = x)$	r	0.3	s	$4r$

$$P(0 \leqslant X < 3) = 0.4$$
$$P(X = 0) + P(X = 2) = 0.4$$
$$r + 0.3 = 0.4$$
$$r = 0.1$$

$$\Sigma P(X = x) = 1$$
$$r + 0.3 + s + 4r = 1$$
$$0.1 + 0.3 + s + 0.4 = 1$$
$$0.8 + s = 1$$
$$s = 0.2$$

(b) (i)



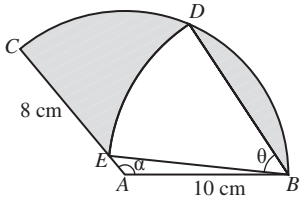
$$P(X > \mu + 5) = 0.2$$
$$P\left(Z > \frac{(\mu + 5) - \mu}{\sigma}\right) = 0.2$$
$$P\left(Z > \frac{5}{\sigma}\right) = 0.2$$
$$\frac{5}{\sigma} = 0.842$$
$$\sigma = \frac{5}{0.842}$$
$$\sigma = 5.938$$

$\therefore$ Sisihan piawai bagi jisim telur ayam ialah 5.938 g.
$\therefore$ *The standard deviation for the mass of chicken eggs is* 5.938 g.

(ii) $P(X > 60)$
$$= P\left(Z > \frac{60 - 62}{5.938}\right)$$
$$= P(Z > -0.337)$$
$$= P(Z < 0.337)$$
$$= 1 - P(Z > 0.337)$$
$$= 1 - 0.3681$$
$$= 0.6319$$

KERTAS 2

1 (a)



$12\theta = 8.4$

$\theta = 0.7$ rad

$\frac{1}{2}(10^2)(\alpha) = 125$

$50\alpha = 125$

$\alpha = 2.5$

(b) Luas bagi rantau berlorek

Area of the shaded region

$= 125 - \frac{1}{2}(12^2)(0.7) - \frac{1}{2}(2)(10)\sin 2.5^r$

$= 125 - 50.4 - 5.985$

$= 68.62 \text{ cm}^2$

2 (a) (i) $\overrightarrow{AB} + \overrightarrow{BC} = \overrightarrow{AC}$

$\overrightarrow{BC} = \overrightarrow{AC} - \overrightarrow{AB}$

$= 2\underset{\sim}{y} - 6\underset{\sim}{x}$

(ii) $\overrightarrow{AE} = \overrightarrow{AB} + \overrightarrow{BE}$

$= \overrightarrow{AB} + \frac{2}{5}\overrightarrow{BC}$

$= 6\underset{\sim}{x} + \frac{2}{5}(2\underset{\sim}{y} - 6\underset{\sim}{x})$

$= 6\underset{\sim}{x} + \frac{4}{5}\underset{\sim}{y} - \frac{12}{5}\underset{\sim}{x}$

$= \frac{18}{5}\underset{\sim}{x} + \frac{4}{5}\underset{\sim}{y}$

Kaedah alternatif

Alternative method

$\overrightarrow{AE} = \overrightarrow{AC} + \overrightarrow{CE}$

$= \overrightarrow{AC} - \overrightarrow{EC}$

$= \overrightarrow{AC} - \frac{3}{5}\overrightarrow{BC}$

$= 2\underset{\sim}{y} - \frac{3}{5}(2\underset{\sim}{y} - 6\underset{\sim}{x})$

$= 2\underset{\sim}{y} - \frac{6}{5}\underset{\sim}{y} + \frac{18}{5}\underset{\sim}{x}$

$= \frac{18}{5}\underset{\sim}{x} + \frac{4}{5}\underset{\sim}{y}$

(b) $\overrightarrow{AC} + \overrightarrow{CD} = \overrightarrow{AD}$

$\overrightarrow{CD} = \overrightarrow{AD} - \overrightarrow{AC}$

$= \frac{2}{3}\overrightarrow{AB} - \overrightarrow{AC}$

$= \frac{2}{3}(6\underset{\sim}{x}) - 2\underset{\sim}{y}$

$= 4\underset{\sim}{x} - 2\underset{\sim}{y}$

$\overrightarrow{AC} + \overrightarrow{CP} = \overrightarrow{AP}$

$\overrightarrow{AC} + k\overrightarrow{CD} = h\overrightarrow{AE}$

$2\underset{\sim}{y} + k(4\underset{\sim}{x} - 2\underset{\sim}{y}) = h\left(\frac{18}{5}\underset{\sim}{x} + \frac{4}{5}\underset{\sim}{y}\right)$

$4k\underset{\sim}{x} + (2 - 2k)\underset{\sim}{y} = \frac{18h}{5}\underset{\sim}{x} + \frac{4h}{5}\underset{\sim}{y}$

Bandingkan pekali bagi $\underset{\sim}{x}$,

Comparing the coefficients of $\underset{\sim}{x}$,

$4k = \frac{18h}{5}$

$10k = 9h \ldots ①$

Bandingkan pekali bagi $\underset{\sim}{y}$,

Comparing the coefficients of $\underset{\sim}{y}$,

$2 - 2k = \frac{4h}{5}$

$1 - k = \frac{2h}{5}$

$5 - 5k = 2h \ldots ②$

$① + ② \times 2, \; 10 = 9h + 4h$

$10 = 13h$

$h = \frac{10}{13}$

Daripada ①,

From ①,

$10k = 9\left(\frac{10}{13}\right)$

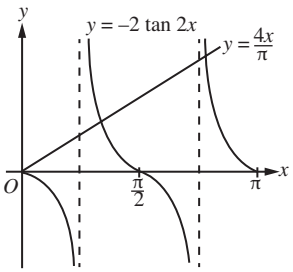
$k = \frac{9}{13}$

3 (a) $\frac{2\cot x}{\cot^2 x - 1} = \frac{\frac{2}{\tan x}}{\frac{1}{\tan^2 x} - 1}$

$= \frac{2\tan x}{1 - \tan^2 x}$

$= \tan 2x$

(b)



(c) $\frac{x}{\pi} + \frac{\cot x}{\cot^2 x - 1} = 0$

$\frac{2x}{\pi} + \frac{2\cot x}{\cot^2 x - 1} = 0$

$\frac{2x}{\pi} + \tan 2x = 0$

$\frac{2x}{\pi} = -\tan 2x$

$\frac{4x}{\pi} = -2\tan 2x$

$y = \frac{4x}{\pi}$

Daripada graf, garis lurus $y = \frac{4x}{\pi}$ memotong graf $y = -2\tan 2x$ pada 3 titik.

$\therefore$ Bilangan penyelesaian bagi persamaan $\frac{x}{\pi} + \frac{\text{kot } x}{\text{kot}^2 x - 1} = 0$ untuk $0 \leqslant x \leqslant \pi$ ialah 3.

From the graph, the straight line $y = \frac{4x}{\pi}$ *cuts the graph* $y = -2\tan 2x$ *at 3 points.*

$\therefore$ *The number of solutions for the equation* $\frac{x}{\pi} + \frac{\cot x}{\cot^2 x - 1} = 0$ *for* $0 \leqslant x \leqslant \pi$ *is* 3.

4 (a) (i) $\int_{-2}^{4} f(x)\,dx = \int_{-2}^{0} f(x)\,dx + \int_{0}^{4} f(x)\,dx$

$= 8 + 5$

$= 13$

(ii) $\int_{0}^{4}\left[\frac{1}{2}x + 3f(x)\right]dx = \int_{0}^{4}\frac{1}{2}x\,dx + 3\int_{0}^{4} f(x)\,dx$

$= \left[\frac{x^2}{4}\right]_0^4 + 3(5)$

$= (4 - 0) + 15$

$= 19$

(iii) $\int_{0}^{4}[6f(x) - rg(x)]\,dx = 9$

$6\int_{0}^{4} f(x)\,dx - r\int_{0}^{4} g(x)\,dx = 9$

$6(5) - r(3) = 9$

$$30 - 3r = 9$$
$$3r = 21$$
$$r = 7$$

(b) $\int_1^4 \left(\frac{\sqrt{x}}{4} + \frac{4}{\sqrt{x}}\right) dx = \int_1^4 \left(\frac{1}{4}x^{\frac{1}{2}} + 4x^{-\frac{1}{2}}\right) dx$

$$= \left[\frac{1}{4}\left(\frac{x^{\frac{3}{2}}}{\frac{3}{2}} + 4\frac{x^{\frac{1}{2}}}{\frac{1}{2}}\right)\right]_1^4$$

$$= \left[\frac{1}{6}x^{\frac{3}{2}} + 8\sqrt{x}\right]_1^4$$

$$= \left[\frac{1}{6}\left(4^{\frac{3}{2}}\right) + 8\sqrt{4}\right] - \left[\frac{1}{6} + 8\right]$$

$$= \frac{1}{6}\left((2^2)^{\frac{3}{2}}\right) + 8(2) - \frac{1}{6} - 8$$

$$= \frac{4}{3} + 16 - \frac{1}{6} - 8$$

$$= 9\frac{1}{6}$$

5 (a) Bilangan cara untuk menyusun empat huruf
Number of ways to arrange four letters
$= {}^6P_4$
$= 360$

Bilangan cara untuk menyusun dua digit
Number of ways to arrange two digits
$= {}^5P_2$
$= 20$

Bilangan cara untuk menyusun kesemua empat huruf bersebelahan dan kedua-dua digit bersebelahan
Number of ways to arrange all the four letters next to each other and both the digits next to each other
$= 2!$

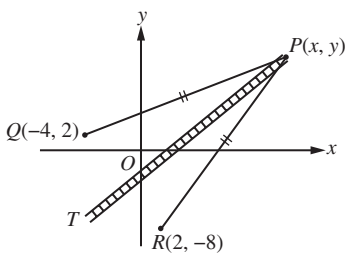
Bilangan kata laluan berlainan yang boleh dibentuk
Number of different passwords that can be formed
$= 360 \times 20 \times 2!$
$= 14\,400$

(b)

Bilangan huruf konsonan *Number of consonants*	**Bilangan huruf vokal** *Number of vowels*	**Bilangan digit** *Number of digits*	**Bilangan susunan** *Number of arrangements*
2	2	2	${}^4C_2 \times {}^2C_2 \times {}^5C_2 \times 6!$ $= 43\,200$
3	1	2	${}^4C_3 \times {}^2C_1 \times {}^5C_2 \times 6!$ $= 57\,600$
4	0	2	${}^4C_4 \times {}^5C_2 \times 6!$ $= 7\,200$

Bilangan kata laluan berlainan yang boleh dibentuk
Number of different passwords that can be formed
$= 43\,200 + 57\,600 + 7\,200$
$= 108\,000$

6 (a)



$$PQ = PR$$
$$PQ^2 = PR^2$$
$$(x+4)^2 + (y-2)^2 = (x-2)^2 + (y+8)^2$$
$$x^2 + 8x + 16 + y^2 - 4y + 4 = x^2 - 4x + 4 + y^2 + 16y + 64$$
$$12x - 20y = 48$$
$$3x - 5y = 12$$

$\therefore$ Persamaan bagi landasan kereta api PT ialah $3x - 5y = 12$.
$\therefore$ *Equation of the railway track PT is* $3x - 5y = 12$.

Kaedah alternatif
Alternative method

$$m_{QR} = \frac{2-(-8)}{-4-2}$$
$$= \frac{10}{-6}$$
$$= -\frac{5}{3}$$
$$m_{QR} = \frac{3}{5}$$

Titik tengah bagi QR
Midpoint of QR
$= \left(\frac{-4+2}{2}, \frac{2-8}{2}\right)$
$= (-1, -3)$

Persamaan bagi landasan kereta api PT:
Equation of the railway track PT:
$$y - (-3) = \frac{3}{5}(x+1)$$
$$5y + 15 = 3x + 3$$
$$3x - 5y = 12$$

(b) (i) $3x - 5y = 12 \ldots ①$
$15x - 5y = 72 \ldots ②$
$② - ①,\ 12x = 60$
$x = 5$

Daripada ①,
From ①,
$3(5) - 5y = 12$
$15 - 5y = 12$
$-5y = -3$
$y = \frac{3}{5}$

$\therefore$ Koordinat bagi stesen kereta api itu ialah $\left(5, \frac{3}{5}\right)$.

$\therefore$ *The coordinates of the railway station are* $\left(5, \frac{3}{5}\right)$.

(ii) Pada titik S, $x = -\frac{8}{3}$ dan $y = -4$,
At point S, $x = -\frac{8}{3}$ *and* $y = -4$,

$$3x - 5y = 3\left(-\frac{8}{3}\right) - 5(-4)$$
$$= -8 + 20$$
$$= 12$$

$$15x - 5y = 15\left(-\frac{8}{3}\right) - 5(-4)$$
$$= -40 + 20$$
$$= -20$$
$$\neq 72$$

S tidak terletak pada jalan lurus VW.
$\therefore$ S terletak pada landasan kereta api PT.
S does not lie on the straight road VW.
$\therefore$ *S lies on the railway track PT.*

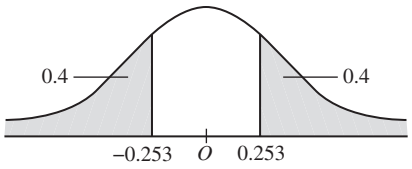
7 (a) X = bilangan murid yang menunggang motosikal ke sekolah
X = *number of students who ride motorcycles to schools*

$X \sim B(12, 0.3)$

P(kurang daripada 2 orang murid menunggang motosikal ke sekolah)
P(*less than* 2 *students ride motorcycles to schools*)
$= P(X < 2)$
$= P(X = 0) + P(X = 1)$
$= {}^{12}C_0(0.3)^0(1-0.3)^{12} + {}^{12}C_1(0.3)^1(1-0.3)^{11}$
$= 0.01384 + 0.07118$
$= 0.08502$

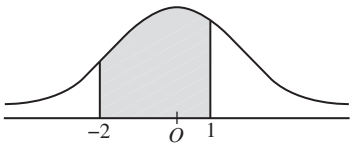
(b) X = Jisim durian yang dihasilkan
X = *Mass of durians produced*
$X \sim N(m, 0.6^2)$

(i) P(jisim durian kurang daripada 2.25 kg) = 0.4
P(*mass of durians less than* 2.25 kg) = 0.4
$P(X < 2.25) = 0.4$
$P\left(Z < \dfrac{2.25-m}{0.6}\right) = 0.4$



$\dfrac{2.25-m}{0.6} = -0.253$
$2.25 - m = -0.1518$
$m = 2.4$

(ii) P(jisim durian antara 1.2 kg dengan 3.0 kg)
P(*mass of durians between* 1.2 kg *and* 3.0 kg)
$= P(1.2 < X < 3.0)$
$= P\left(\dfrac{1.2-2.4}{0.6} < Z < \dfrac{3.0-2.4}{0.6}\right)$
$= P(-2 < Z < 1)$



$= 1 - P(Z > 2) - P(Z > 1)$
$= 1 - 0.0228 - 0.1587$
$= 0.8185$

Bilangan durian yang mempunyai jisim antara 1.2 kg dengan 3.0 kg
Number of durians that have a mass between 1.2 kg *and* 3.0 kg
$= 0.8185 \times 1\,550$
$= 1\,269$

8 (a) $f(x) = 2 + \dfrac{1}{x-3}, x \neq 3$

$g(x) = \dfrac{3x-5}{x-2}, x \neq 2$

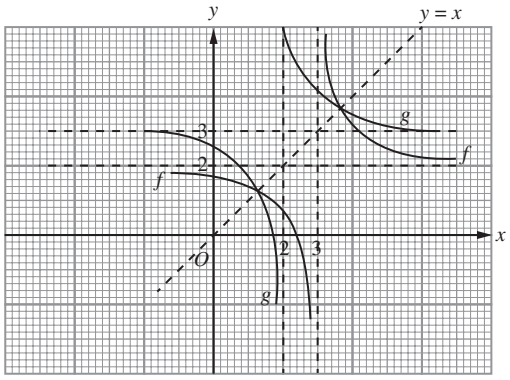
$fg(x) = f[g(x)]$
$= f\left(\dfrac{3x-5}{x-2}\right)$
$= 2 + \dfrac{1}{\dfrac{3x-5}{x-2} - 3}$
$= 2 + \dfrac{x-2}{3x-5-3(x-2)}$
$= 2 + \dfrac{x-2}{3x-5-3x+6}$
$= 2 + x - 2$
$= x$

$\therefore f = g^{-1}$ dan/*and* $g = f^{-1}$

(b) $g^{-1}f(x) = f[f(x)]$
$= f\left(2 + \dfrac{1}{x-3}\right)$
$= 2 + \dfrac{1}{\left(2 + \dfrac{1}{x-3}\right) - 3}$
$= 2 + \dfrac{1}{\dfrac{1}{x-3} - 1}$
$= 2 + \dfrac{x-3}{1-(x-3)}$
$= 2 + \dfrac{x-3}{4-x}$
$= \dfrac{8-2x+x-3}{4-x}$
$= \dfrac{5-x}{4-x}$

(c) $2f^{-1}(x) = 12 - g(x)$
$2g(x) = 12 - g(x)$
$3g(x) = 12$
$g(x) = 4$
$\dfrac{3x-5}{x-2} = 4$
$3x - 5 = 4(x-2)$
$3x - 5 = 4x - 8$
$x = 3$

(d)



9 (a) $a = 403, d = 402 - 403 = -1$
$T_n = a + (n-1)d$
$T_{22} = 403 + (22-1)(-1)$
$= 403 - 21$
$= 382$

$\therefore$ Bilangan paip besi pada lapisan ke-22 ialah 382 batang.
$\therefore$ *The number of iron pipes in the* 22nd *layer is* 382.

(b) $S_{90} = \dfrac{90}{2}[2(403) + (90-1)(-1)] = 32\,265$

$S_{90-m} = \dfrac{90-m}{2}[2(403) + (90-m-1)(-1)] = \dfrac{90-m}{2}(717+m)$

$S_{90} - S_{90-m} = 9\,855$
$32\,265 - \dfrac{90-m}{2}(717+m) = 9\,855$
$\dfrac{90-m}{2}(717+m) = 22\,410$
$(90-m)(717+m) = 44\,820$
$64\,530 - 627m - m^2 = 44\,820$
$m^2 + 627m - 19\,710 = 0$
$(m-30)(m+657) = 0$
$m = 30$ atau/*or* $m = -657$
$m > 0, \therefore m = 30$

(c) $S_n \leqslant 26\,500$
$\dfrac{n}{2}[2(403) + (n-1)(-1)] \leqslant 26\,500$
$n(807-n) \leqslant 53\,000$

$$807n - n^2 \leqslant 53\,000$$
$$n^2 - 807n + 53\,000 \geqslant 0$$
$$\left(n - \frac{807}{2}\right)^2 - \left(\frac{807}{2}\right)^2 + 53\,000 \geqslant 0$$
$$\left(n - \frac{807}{2}\right)^2 \geqslant 109\,812.25$$
$$n - \frac{807}{2} \geqslant 331.38 \quad \text{atau/}or \quad n - \frac{807}{2} \leqslant -331.38$$
$$n \geqslant 734.88 \quad \text{atau/}or \quad n \leqslant 72.12$$

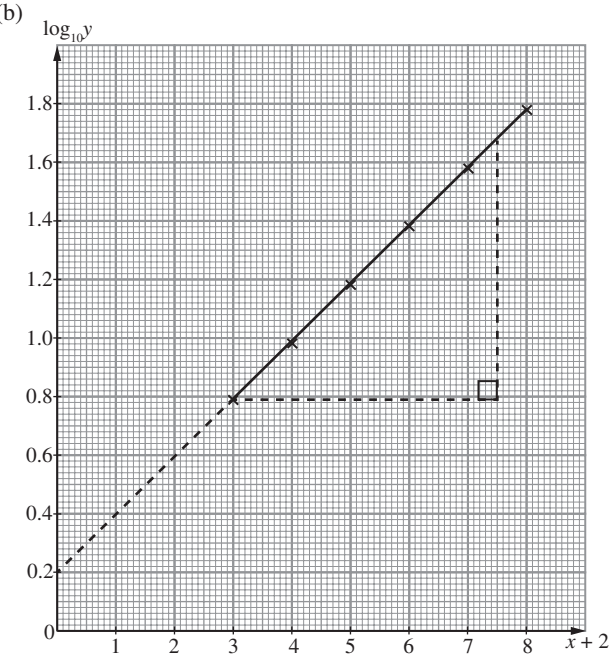
Oleh sebab $n \leqslant 90, n \leqslant 72.12$
As $n \leqslant 90, n \leqslant 72.12$
$\therefore n = 72$

$\therefore$ Bilangan lapisan maksimum dalam longgokan yang mempunyai 26 500 batang paip besi ialah 72.
$\therefore$ *The maximum number of layers in the pile that has* 26 500 *iron pipes is* 72.

10 (a)

$x + 2$	3	4	5	6	7	8
$\log_{10} y$	0.79	0.99	1.18	1.38	1.58	1.77

(b)



(c) $y = kp^{x+2}$
$\log_{10} y = \log_{10} k + \log_{10} p^{x+2}$
$\log_{10} y = \log_{10} k + (x + 2)\log_{10} p$
$Y = \log_{10} y, X = x + 2$
$Y = \log_{10} k + X \log_{10_p}$

Pintasan-Y:
Y-intercept:
$\log_{10} k = 0.2$
$k = 10^{0.2}$
$= 1.58$

Kecerunan:
Gradient:
$$\log_{10} p = \frac{1.68 - 0.79}{7.5 - 3}$$
$$= \frac{0.89}{4.5}$$
$$= 0.1978$$
$$p = 10^{0.1978}$$
$$p = 1.58$$

11 (a) $y = x(3 - 2x)^3$
$$\frac{dy}{dx} = x[3(3 - 2x)^2(-2)] + (3 - 2x)^3(1)$$
$$= -6x(3 - 2x)^2 + (3 - 2x)^3$$
$$= (3 - 2x)^2[-6x + (3 - 2x)]$$
$$= (3 - 2x)^2(3 - 8x)$$

Apabila $x = 2$,
When $x = 2$,
$y = 2(3 - 4)^3$
$= -2$
$$\frac{dy}{dx} = [3 - 2(2)]^2[3 - 8(2)]$$
$$= (-1)^2(-13)$$
$$= -13$$

Persamaan tangen pada (2, –2):
Equation of tangent at (2, –2):
$y - (-2) = -13(x - 2)$
$y + 2 = -13x + 26$
$y = -13x + 24$

(b) Apabila $\frac{dy}{dx} = 0$,
When $\frac{dy}{dx} = 0$,
$(3 - 2x)^2(3 - 8x) = 0$
$x = \frac{3}{2}$ atau/*or* $x = \frac{3}{8}$

$\therefore$ Lengkung $y = x(3 - 2x)^3$ mempunyai dua titik pusingan.
$\therefore$ *The curve* $y = x(3 - 2x)^3$ *has two turning points.*

Apabila $x = \frac{3}{2}$,
When $x = \frac{3}{2}$,
$y = \frac{3}{2}(3 - 3)^3 = 0$

x	$< \frac{3}{2}$	$\frac{3}{2}$	$> \frac{3}{2}$
Tanda untuk $\frac{dy}{dx}$ ***Sign for*** $\frac{dy}{dx}$	–	0	–
Lakaran tangen ***Sketch of the tangent***	\	—	\

$\therefore \left(\frac{3}{2}, 0\right)$ ialah titik lengkok balas.
$\therefore \left(\frac{3}{2}, 0\right)$ *is a point of inflection.*

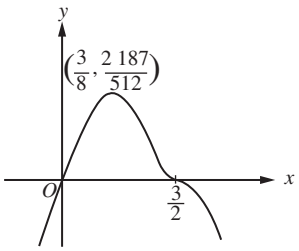
Apabila $x = \frac{3}{8}$,
When $x = \frac{3}{8}$,
$$y = \frac{3}{8}\left(3 - \frac{3}{4}\right)^3$$
$$= \frac{3}{8}\left(\frac{9}{4}\right)^3$$
$$= \frac{2\,187}{512}$$

x	$< \frac{3}{8}$	$\frac{3}{8}$	$> \frac{3}{8}$
Tanda untuk $\frac{dy}{dx}$ ***Sign for*** $\frac{dy}{dx}$	+	0	–
Lakaran tangen ***Sketch of the tangent***	/	—	\

$\therefore \left(\frac{3}{8}, \frac{2\,187}{512}\right)$ ialah titik maksimum.

$\therefore \left(\frac{3}{8}, \frac{2\,187}{512}\right)$ *is a maximum point.*

(c)



12 (a) $I_{2016/2011} = \frac{P_{2016}}{P_{2011}} \times 100$

$150 = \frac{105}{P_{2011}} \times 100$

$P_{2011} = \frac{105}{150} \times 100$

$= 70$

Harga bahan mentah *A* yang sepadan pada tahun 2011 ialah RM70.
The corresponding price of raw material A in the year 2011 *is* RM70.

(b) $I_{2021/2011} = \frac{P_{2021}}{P_{2011}} \times 100$

$= \frac{P_{2021}}{P_{2016}} \times \frac{P_{2016}}{P_{2011}} \times 100$

Bahan mentah *Raw material*	**Indeks harga pada tahun 2021 berasaskan tahun 2011** *Price index in the year* **2021** *based on the year* **2011**
A	$\frac{124}{100} \times 150 = 186$
B	$\frac{110}{100} \times 130 = 143$
C	$\frac{100}{100} \times 120 = 120$
D	$\frac{95}{100} \times 160 = 152$

(c) (i) $\bar{I} = \frac{\Sigma I_i w_i}{\Sigma w_i}$

$= \frac{186(15) + 143(30) + 120(20) + 152(25)}{15 + 30 + 20 + 25}$

$= \frac{13\,280}{90}$

$= 147.6$

(ii) $\bar{I}_{2021/2016} = \frac{P_{2021}}{P_{2016}} \times 100$

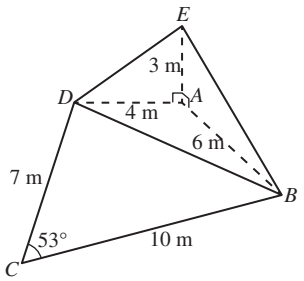
$147.6 = \frac{369}{P_{2016}} \times 100$

$P_{2016} = \frac{369}{147.6} \times 100$

$= 250$

Kos penghasilan makanan ternakan ayam itu pada tahun 2016 ialah RM250.
The cost of producing the chicken feed in the year 2016 *was* RM250.

13



(a) $BD^2 = 7^2 + 10^2 - 2(7)(10)\cos 53°$

$= 64.75$

$BD = 8.05$ m

(b) $\frac{\sin \angle CBD}{7} = \frac{\sin 53°}{8.05}$

$\sin \angle CBD = \frac{7 \sin 53°}{8.05}$

$= 0.6945$

$\angle CBD = 43°59'$

(c) $DE^2 = 3^2 + 4^2$

$= 25$

$DE = 5$ m

$BE^2 = 3^2 + 6^2$

$= 45$

$BE = 6.71$ m

$\cos \angle BDE = \frac{5^2 + 8.05^2 - 6.71^2}{2(5)(8.05)}$

$= \frac{44.78}{80.50}$

$= 0.5563$

$\angle BDE = 56°\,12'$

Luas bagi segi tiga *BDE*
Area of triangle BDE

$= \frac{1}{2}(5)(8.05)\sin 56°\,12'$

$= 16.72$ m^2

Kaedah alternatif
Alternative method

$s = \frac{1}{2}(8.05 + 5 + 6.71)$

$= 9.88$

Luas bagi segi tiga *BDE*
Area of triangle BDE

$= \sqrt{s(s-a)(s-b)(s-c)}$

$= \sqrt{9.88(9.88 - 8.05)(9.88 - 5)(9.88 - 6.71)}$

$= \sqrt{9.88(1.83)(4.88)(3.17)}$

$= \sqrt{279.70}$

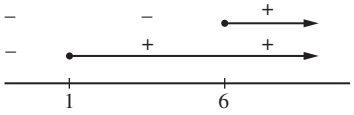
$= 16.72$ m^2

14 (a) $v = t^2 - 7t + 6$

(i) Apabila $t = 0$,
When $t = 0$,
$v = 0^2 - 7(0) + 6$
$= 6$

Halaju awal bagi zarah itu ialah 6 m s^{-1}.
The initial velocity of the particle is 6 m s^{-1}.

(ii) Apabila $v < 0$,
When $v < 0$,
$t^2 - 7t + 6 < 0$
$(t - 1)(t - 6) < 0$



$1 < t < 6$

Julat masa apabila zarah itu menukar arah pergerakannya ialah $1 < t < 6$.
The time interval when the particle changes its direction of movement is $1 < t < 6$.

(iii) $s = \int (t^2 - 7t + 6)\, dt$

$= \frac{t^3}{3} - \frac{7t^2}{2} + 6t + c$

Apabila $t = 0, s = 0, c = 0$,
When $t = 0, s = 0, c = 0$,

$s = \frac{t^3}{3} - \frac{7t^2}{2} + 6t$

Apabila zarah itu kembali ke titik tetap O, $s = 0$.
When the particle returns to the fixed point O, $s = 0$.

$\frac{t^3}{3} - \frac{7t^2}{2} + 6t = 0$

$2t^3 - 21t^2 + 36t = 0$

$t(2t^2 - 21t + 36) = 0$

$t \neq 0, 2t^2 - 21t + 36 = 0$

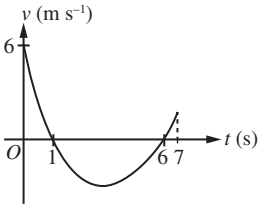
$t = \frac{21 \pm \sqrt{(-21)^2 - 4(2)(36)}}{2(2)}$

$= \frac{21 \pm \sqrt{153}}{4}$

$t = 2.16$ atau/*or* $t = 8.34$

∴ Masa yang diambil oleh zarah itu untuk kembali ke titik tetap O buat kali kedua ialah 8.34 s.
∴ *The time taken by the particle to return to the fixed point O for the second time is* 8.34 s.

(b)



(c) $s = \int_0^1 \left(t^2 - 7t + 6\right) dt + \left| \int_1^6 \left(t^2 - 7t + 6\right) dt \right| + \int_6^7 \left(t^2 - 7t + 6\right) dt$

$= \left[\frac{t^3}{3} - \frac{7t^2}{2} + 6t\right]_0^1 + \left|\left[\frac{t^3}{3} - \frac{7t^2}{2} + 6t\right]_1^6\right| + \left[\frac{t^3}{3} - \frac{7t^2}{2} + 6t\right]_6^7$

$= \left(\frac{1}{3} - \frac{7}{2} + 6\right) + \left|(72 - 126 + 36) - \left(\frac{1}{3} - \frac{7}{2} + 6\right)\right| +$

$\left[\left(\frac{343}{3} - \frac{343}{2} + 42\right)\right] - (72 - 126 + 36)\Bigg]$

$= 2\frac{5}{6} + \left|-18 - 2\frac{5}{6}\right| + \left[-15\frac{1}{6} - (-18)\right]$

$= 2\frac{5}{6} + \left|-20\frac{5}{6}\right| + 2\frac{5}{6}$

$= 2\frac{5}{6} + 20\frac{5}{6} + 2\frac{5}{6}$

$= 26\frac{1}{2}$

∴ Jumlah jarak yang dilalui oleh zarah itu dalam 7 saat ialah $26\frac{1}{2}$ m.
∴ *The total distance travelled by the particle in* 7 *seconds is* $26\frac{1}{2}$ m.

15 (a) x = Bilangan bas sekolah yang disewa
x = *Number of school buses rented*

y = Bilangan van yang disewa
y = *Number of vans rented*

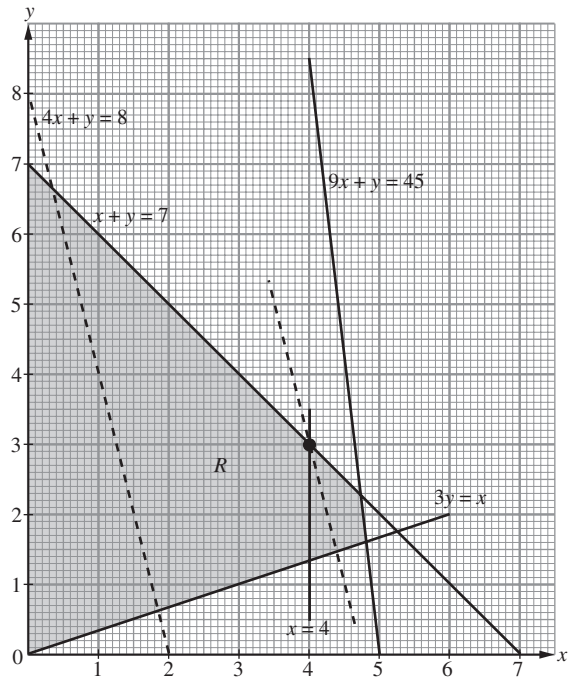
$x + y \leqslant 7$

$x \leqslant 3y$

$900x + 100y \leqslant 4\,500$

$9x + y \leqslant 45$

(b)



(c) (i) Apabila $x = 4$, nilai integer minimum bagi y ialah 2.
∴ Bilangan minimum van yang disewa ialah 2 buah.
When $x = 4$, *the minimum integer value of* y *is* 2.
∴ *The minimum number of vans rented is* 2 *units.*

(ii) Jumlah bilangan penumpang $= 40x + 10y$
Total number of passengers $= 40x + 10y$
$40x + 10y = 80$
$4x + y = 8$

Jumlah bilangan maksimum penumpang
Total maximum number of passengers
$= 40(4) + 10(3)$
$= 190$